

THE QUARANTINE SYSTEM OF LOUISIANA

METHODS OF DISINFECTION PRACTISED.

no. 4

WITH ILLUSTRATIONS.

BY JOSEPH HOLT, M. D.,

PRESIDENT BOARD OF HEALTH, STATE OF LOUISIANA



An ADDENDUM to the REPORT of the COMMITTEE on DISINFECTANTS

— OF THE —

AMERICAN PUBLIC HEALTH ASSOCIATION,

SUBMITTED AT MEMPHIS, TENN., NOVEMBER, 1887.

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THE QUARANTINE SYSTEM OF LOUISIANA.

METHODS OF DISINFECTION PRACTISED.

By JOSEPH HOLT, M. D., President Board of Health, State of Louisiana.

Gentlemen of the Committee:

In describing the methods of disinfection used in the quarantine of Louisiana, it is necessary first to examine the system itself synthetically.

There are three maritime approaches to New Orleans; the Mississippi River, which is the central and main avenue; the Rigolets, thirty miles to the eastward, a narrow strait connecting Lake Pontchartrain with Lake Borgne, and the Gulf of Mexico; and the Atchafalaya River near its debouchment into the bay of that name and Mexican Gulf, eighty-two miles to the westward.

On account of the character of shipping coming through the two lateral approaches, "light in tonnage and mostly from domestic ports," the Rigolets and Atchafalaya are completely closed by a proclamation of forty days detention against all vessels from quarantined ports, compelling such to seek the Mississippi as the only available route to New Orleans. This is done in order to avoid the immense expense of keeping up three completely equipped stations, and to concentrate at a single point the fight against infection.

The quarantine in the Mississippi is a system composed of three stations, the first of which is an advance guard inspection station, situated at Port Eads, one hundred and ten miles below New Orleans, where the waters of South Pass are jettied into the Gulf.

When an inward bound vessel comes into the offing, she is immediately boarded by a thoroughly skilled medical officer, and a careful inspection is made of her sanitary record and present condition.

If from a non-quarantined port and all is well, she is given pratique and goes on to the city. If from a quarantined port, but presenting a clean health record of voyage, and no evidence of sickness of a dangerous or doubtful character, she proceeds to the upper quarantine station, situated on the left bank of the river, seventy miles below the city, where she is subjected to a full course of sanitary treatment, and is detained such length of time, not exceeding five days (except in rare instances, wherein further observation may be deemed necessary), as the Board of Health may provide.

If, upon inspection of a vessel entering the river, she is found to be foul—that is, showing positive or suspicious evidences of infection, either in a person then ill or in a foul health record of voyage, she is at once remanded to the lower station, located on Pass à L'Outre, an unused outlet of the Mississippi, one hundred and three miles below the city. The sick, if any, are at once removed to the hospital, where every provision has been made for them. The vessel, with the well on board, is dropped down stream a few hundred yards and anchored. In the mean time the quarantine tugboat with its complete disinfecting outfit has been telegraphed for and speedily arrives from the upper station, when the work of disinfection begins and does not cease until the vessel has been subjected to the most vigorous application of the solution of the bichloride of mercury; her atmosphere, below deck, completely replaced with one heavily charged with sulphurous oxide, and every article of baggage and ship's wardrobe has been saturated with the mercuric solution.

A ship known to be infected with one of the three great pestilential diseases—small-pox, cholera or yellow fever—can stand and must endure extraordinary treatment, even if clothing is wetted and some articles damaged. “They who go down to the sea in ships” assume the perils of the voyage, among which is

this occurrence of finding themselves on an infected vessel and being compelled to undergo a cleansing, for they have no right to bring their perils ashore and endanger others.

The immediate segregation of the sick and the well, and disinfection of the ship and all baggage (in the care of a cholera-infected vessel extended to the disinfectant washing-out and refilling of the water-tanks, destruction of the food supply and revictualling the vessel), constitute the treatment of an infected vessel at this station. The ship, together with all on board, is held for observation a period of ten days, or more, according to circumstances, when she is released and proceeds to the Upper Station, where the processes of sanitary treatment are repeated, with the addition of the use of moist heat applied to baggage, ship's apparel etc. (which latter process will be described hereafter), and the vessel is then allowed to proceed to the city.

This course of treatment at the Upper Station, while probably unnecessary, is enforced purely as an extraordinary precaution.

Inasmuch as infected ships are the exceptions, but inasmuch also as the Board of Health will take no risk in the case of vessels from known infected or suspected ports, regardless of bills of health, the vast majority of vessels are treated at the Upper Station.

Arriving at this station the vessel is brought alongside the wharf. All on board—officers, crew and passengers—are at once sent ashore, where they find ample accommodation in commodious shelter, provided for their entertainment during the time occupied in the sanitary treatment of the ship and all baggage.

As soon as this is completed they are permitted to return aboard ship, where they remain under observation during the prescribed period, determined by the remoteness or nearness of the port against which these precautions are taken.

The object of this brief detention for observation, after the sanitary treatment of the vessel has been

completed, is to allow for a probable outbreak of an infectious disease already incubating in the system of any one on board.

As an essential part of the service there is a tugboat of sufficient power to move a sailing vessel to or from the wharf.

In addition to this requirement, this boat is equipped with a complete outfit for generating and applying germicidal gas for displacement of the entire atmosphere within the ship, transported perhaps, directly from some infected port. In the hold of this tug is constructed a wooden tank of 2000 gallons capacity, to hold the bi-chloride of mercury solution for the treatment of vessels in the Lower Quarantine, as described. This tank is furnished with a steam pump (made of iron on account of the greater resistance of that metal to amalgamation) supplied with three-quarter-inch rubber hose. (See plate 1.)

In the sanitary treatment of a vessel in quarantine, there are three processes of disinfection concurrently applied.

APPLICATION OF BI-CHLORIDE OF MERCURY.

The first is the wetting of all available surfaces of the vessel, excepting cargo, but including bilge, ballast, hold, saloons, forecastle, decks, etc., with a solution of the bi-chloride of mercury, made soluble by an equal weight of muriate of ammonia, in the proportion of one part to one thousand of water.

The idea of using this agent as a disinfectant in "municipal and maritime sanitation" suggested itself to me while reading the chapter on "Wound Disinfection-Antiseptics," in the volume entitled "The Treatment of Wounds," by Lewis S. Pilcher, M. D., containing an account of the experiments of Dr. George M. Sternberg, with a table of chemical agents and their relative germicidal strengths (at the head of which stands the bi-chloride of mercury) and also a table of the results obtained by Koch in Berlin, 1881, and by Schede and Kümmel in the Hamburg General Hospital in the same year.

The Board of Health immediately endorsed the idea and ordered the adoption of the bi-chloride of mercury as explained in the following letter:

NEW ORLEANS, July 17, 1884.

Dr. Thomas Y. Aby, Resident Physician Mississippi Quarantine Station:

Dear Sir—Because of the signal failure of carbolic acid as a disinfectant and prophylactic agent after a trial more fair and extended than has ever been allowed any other; because of its excessively offensive odor and the oppressive and sometimes mischievous effects of its fumes; because of the low order of the commercial acid as a germicide and the considerable expense involved in its use, you are hereby requested to discontinue its application.

In its stead I have ordered to your station two packages of bi-chloride of mercury and muriate of ammonia, the latter to act as a solvent.

In its preparation for use take five and a half ounces of each and dissolve in a half gallon of water; add this to forty gallons of water in a cask. I have sent three large watering pots, with a fine rose or spray. Your men can quickly wet down a ballast pile and all available surfaces of a ship, and it needs no repetition when once thoroughly applied.

The advantages of this agent are briefly these: The mercuric bi-chloride stands preëminently above all chemicals as a universal germicide. Not only are definite organisms immediately destroyed, but all protoplasms and albuminoids are devitalized by it. It is efficient to accomplish this work when applied in a solution so weak as not to be recognized except by chemical re-agents. It is devoid of color or smell. It does not poison the air by vaporizing, but adheres in an innocuous form to the surfaces upon which originally applied. Its cost is about one-eighth that of carbolic acid.

I feel that this transition is quite as much of a relief to you, my dear doctor, as to the afflicted people

on shipboard, who must surely suffer severely from the stifling fumes emanating from carbolic acid applied to surfaces heated by a July sun, as the people of this city can testify to their terrible cost!

The position of persons confined on shipboard under such circumstances, particularly in the instance of women and children as passengers, as related by yourself, must at times be most distressing. The Board of Health heartily joins with you in the satisfaction and sense of relief afforded by this change, which is an important step in the great work of humanizing our quarantine."

I remain, with great esteem, yours very truly,

(Signed) JOSEPH HOLT, M. D.,
President Board of Health, State of Louisiana.

The bold adoption of this poisonous agent in domestic, municipal and maritime sanitation at once called forth a flood of most gloomy forebodings of fearful effects upon the human system.

Our declaration at that time is confirmed by an experience of four years' trial on an immense scale, that our standard solution, as used in sanitation, is absolutely harmless to persons unless swallowed, it matters not how extensive or constant the contact. The only objection we have yet discovered is that certain articles, particularly blankets and flannels, treated by the solution sometimes become spotted, and colors liable to "run" when wetted, suffer; but unlike all other chemical agents applied as disinfectants, the textile itself is in nowise injured.

Recapitulating its merits: being colorless, stainless (except as stated), odorless, not injurious to fabrics, perfectly safe to handle for months at a time, easily applied and exceedingly cheap, it is impossible to imagine a substance more efficient and as free from objection in practice. It is indeed the key unlocking difficulties otherwise insurmountable, and rendering practicable in municipal and maritime sanitary work the efficient execution of scientific requirement.

The amalgamating powers of the mercuric salt presented many serious obstacles in the contrivance of an apparatus for its application, all of which have been overcome without sacrificing simplicity, efficiency or economy.

Immediately adjoining the quarantine wharf and near its water edge, is constructed a heavy framework of piles, each twelve inches in diameter. This structure has an ample base, is pyramidal, and forty-five feet in height above mean level of the river. On top of this is a circular wrought iron tank, capable of holding eight thousand gallons of the mercuric solution. (See plate 2.)

In order to prevent contact of the latter with the iron, the interior of the tank is painted over with three coats of red lead and two of paraffine paint. The top of the tank is closed by a secure cover to prevent access of light to the solution. This, together with the general exterior, is painted black.

On the top of this cover is placed centrally a sixty gallon wooden cask, in which is dissolved the mercuric salt, which is then emptied into the tank through a wooden faucet. Seventy pounds are used for one charge.

In the tank near the lower edge are three heavy galvanized iron faucets, to each of which is screwed a lead of three-quarter inch, four-ply rubber hose, the farther ends of which lie on the wharf. These are lengthened by additional sections to reach any part of the largest vessel. To the far extremity of each hose is attached a short, wide nozzle, provided with a stop-cock.

During disinfection, all three are simultaneously used, fore, aft and amidship.

For spraying, we use a perforated, heavy block-tin rose, four inches across the face, similar to an ordinary watering-pot spray. These are made with a shank about six inches long, to fit snugly into the open end of the pipe.

On a single vessel we average fifteen hundred gallons of solution, but often use three thousand.

The process requires from thirty minutes to two hours according to circumstances.

SULPHUROUS OXIDE FUMIGATION.

As soon as the men have completed the work of "bi-chloriding" below decks, the fumigating pipe is then extended from the quarantine tugboat lying alongside. (See plates 1 and 2) It is lengthened by sections, being fitted together like stovepipe, and conducted down a convenient hatchway to the bottom of the hole or as near the keelson as possible, preparatory to the fumigation of the entire vessel (and cargo if any) with sulphurous oxide. In the case of a sailing ship, one hatchway gives access of the sulphurous gas to the entire hold; but in large steamers the hold is sub-divided by bulkheads into two or more distinct compartments which must be treated separately.

In undergoing treatment, the cargo is not disturbed, except when the removal of bags of coffee is required, to permit the passage of the fumigating pipe, which is twelve inches in diameter, down into the dunnage at the bottom of the cargo.

I have given explicit instructions to coffee importers, whereby the expense of removing bags to make this well or shaft through the cargo, may be avoided. It is necessary to have an open, frame-work shaft, allowing a clear inside space of fifteen inches, placed in the centre of the main hatch in a sailing vessel, or in the centre of each hatch in a steamship having bulkhead compartments. The frame-work of this shaft is set before loading and should be cut flush with the top of the cargo.

This simple arrangement avoids all handling and delay.

When the connections are made and the fumigating pipe is arranged, the fan on the tugboat is started and the process, of displacing with sulphurous oxide the entire atmosphere within the ship, begins.

The length of time required to complete the fumigation varies from thirty minutes to three hours, according to size of vessel, number of compartments, etc.

The quantity of commercial roll sulphur used varies from one hundred to seven hundred pounds per vessel.

The apparatus invented for rapidly evolving and supplying the germicidal gas consists in a battery of eighteen furnaces, each supplied with a pan to contain the sulphur during combustion. These furnaces open into a common reservoir, to the farther end of which is connected a powerful exhaust fan. (Sturtevant's No. 29.) (See plates 3 and 4.)

The gas drawn by the fan is driven into a twelve inch galvanized iron pipe, through which it is conducted over the side and down the hatchway of the vessel, into the bottom of the hold.

The gas, as it is driven into the vessel, is quite hot, but would extinguish rather than create fire.

The outflow should not impinge directly against bags of coffee or bales of textiles, if it can be avoided, in order to prevent formation of sulphuric acid and some slight injury therefrom at that point.

In treating coffee, and for convenience in some other instances, the vertical lead of pipe into the hold is made of asbestos cloth, closely and heavily woven for our purpose.

Every opening is closely battened during the process and remains so for at least eight hours after it is discontinued.

The apparatus throughout is made ample in size and power for rapidity of work and economy in wear and tear, by lessening velocity and friction. The fan is run by a special engine at a slow rate as compared with its capacity, but driving into the ship 180,000 cubic feet per hour of atmosphere surcharged with sulphurous oxide.

APPLICATIONS OF DRY AND MOIST HEAT.

While these two processes of sanitary treatment of the vessel are going on, all bedding, ship's linen, cushions, mattresses, flags, mosquito nets, curtains, carpets, rugs, all personal baggage and wearing apparel of whatever description, are removed from the ship to a commodious building in close proximity (see plate 5), in which these articles are treated by moist heat at a temperature of not less than 230° Fahrenheit.

The apparatus for this work consists in a steel, 40-horse power steam boiler (see plate 9), for supplying steam to a superheating chamber a few feet distant, and which I will now describe. (See plates 6, 7 and 8.)

The dimensions of this chamber, taken interiorly or inside measure, are 60 feet long, 11 feet wide and 7 feet high.

The frame work is composed of 3x3 inch seasoned pine lumber, joined as in the construction of a frame house. Upon the outside of this frame work (and corresponding to weatherboarding in the case of a house) is nailed tongued-and-grooved flooring material three-fourths of an inch thick by six inches wide.

The inside or interior of the ends, rear and top of the chamber is ceiled with the same material and a flooring of the same is also laid. Upon these interior surfaces is tacked heavy "Russian Hair-cloth or Felting;" and upon this, at intervals of three feet, are nailed parallel strips of wood 1 1/2x2 inches, and, in turn, upon these trips is fastened another sheathing or ceiling of flooring plank, as already described.

This secures an air space between the hair-cloth and inner ceiling. Upon this now smooth interior surface of wood is finally tacked and held in place by very broad-headed nails, or better, by nails supplied with tin discs or washers, a double layer of "Asbestos Building Felt," well lapped and securely tacked; thus rendering the interior of the chamber fire-proof.

By the foregoing described construction it will be seen that the walls of the chamber, which are eight inches in thickness, consist of seven non-conducting media; first, the outer layer of planking; second, three inches of air space; third, an inner ceiling of planking; fourth, one inch thickness of "Russian Hair-cloth"; fifth, one and one-half inch air space; sixth, a third layer of three-fourth inch planking; seventh, a double layer, or interior lining, of heavy asbestos felting.

The front wall is divided into forty panels, eighteen inches wide each (see plate 6), which represents that number of racks contained within the chamber.

Upon the bars of these racks the clothing, etc., is hung for exposure to disinfection by moist heat. (See plate 7.)

These racks are constructed with a front and rear panel united by horizontal bars, six to each side. Each rack is suspended overhead, on travelling rollers, upon an iron rod which extends from the rear wall of the chamber to a support ten feet in front of the chamber; the rod, therefore, being twenty feet in length.

By this arrangement overhead, the racks may be drawn out and pushed in with facility, thus avoiding tracks or rods on the floor obstructing the movements of employees.

When drawn out the full length of ten feet, the rear panels of the racks securely close the chamber as do the front panels when the racks are pushed in; thus admitting of the heating of the chamber during the time of hanging the articles of clothing, etc., on the rack-bars preparatory to disinfection.

For this admirable device and, indeed, for the entire skeleton of the super-heating chamber, including the dry-heat double steam coils, we are indebted to the Troy Laundry Machinery Company, Chicago, Ill. We have found the purchase of this apparatus, constructed to include certain of our specifications, to be the most economical and satisfactory we could have desired.

The interior surface of each front panel is lined with a layer of Russian hair-cloth, over which is applied a double layer of asbestos felting.

At intervals of seven and one-half feet a bulkhead of one inch tongued-and-grooved flooring is constructed, subdividing the chamber into eight compartments. These bulkheads, or partitions, are made fire-proof by a covering of a double layer of asbestos felting. The object of this arrangement is to provide against the spread of fire in the event of its occurrence.

In addition to this provision there is a double lead of one-inch fire hose connected with a steam pump near the boiler, and at all times ready, within fifteen seconds' notice, to turn on two streams of water upon any rack on which fire might have originated.

These minute specifications concerning provision against fire are particularly appreciated by ourselves: it cost us two fires and the destruction of a large amount of property to learn a lesson which experience alone could teach. Lacking experience and precedent, these accidents could not have been foreseen, and therefore could not have been provided against. They were the result of an underrating, and failure to appreciate the prodigious force the contrivance invented placed at our will to invoke.

Under the present arrangement, including early use of free steam, fire is hardly possible; but if it should occur we are prepared to draw out instantly the burning panel, to strip it of clothing and to put out the fire.

With reasonable care and watchfulness on the part of the employees there need be absolutely no danger of loss by fire.

The surperheating of this chamber is so provided as to furnish at will dry or moist heat, or both; and by a turn of the hand a temperature of 300° F. can be obtained.

Within and at the end of this chamber next to and connected with the boiler are two manifolds, one above the other, to which is connected a system of forty-five three-quarter-inch steam pipes (aggregating 5,509 lineal feet), placed horizontally near the floor of the chamber, running its full length, and supplied with a "bleeder" for conveying off the water of condensation.

This double coil furnishes the dry heat. (See plate 8.)

Above and in close proximity to this system of pipes is extended a horizontal screen of galvanized iron one-half inch mesh, to catch and so prevent the coming in contact with the super-heating pipes, any article falling from the racks. (See plate 7.)

The moist heat is supplied by a one inch steam pipe laid centrally in the midst of the above described dry heat pipes and running the entire length of the chamber, constituting a steam-main, connected with the boiler and controlled, as the others, by a ball-valve on the outside.

This pipe is perforated by eighty one-twelfth inch holes, so placed as to furnish steam to each rack.

During the time of hanging the articles of clothing, etc., on the racks, the dry heat is turned on and the temperature raised to about 190° F., made known by a thermometer having a large mercurial column, and suspended near the centre of the chamber, working on a slide or traveling rod in such a manner, when it is desired to make a reading, as to allow of being drawn forward (by a cord extending outside) to a long narrow pane of glass set in the panel. This thermometer should have a scale of at least 275° F.

As each rack is filled it is put back into place. By the time the last of the articles have been hung on the racks, the entire mass of the material within the chamber has attained a temperature between 190° and 200° F., when free steam is turned on; the thermometer speedily rises to a point varying between 230° and 240° F., at which it is maintained for a period of twenty minutes.

The steam pressure in the boiler, at the beginning of this process, registers between 100 and 110 pounds by the steam gauge; at the end of the process of blowing in steam the pressure will have fallen to about 60 pounds.

The steam is now entirely cut off from the chamber, the racks are drawn out and their contents removed.

During the process of steaming, every article is perceived to be saturated and intensely hot, the steam freely permeating to the interior of mattresses, double blankets, etc.; but so great is the heat in the texture of the fabrics as to immediately expel all moisture upon drawing the racks and exposure to the open air. Shirts, collars, etc., instantly assume the crisp dryness they possessed before exposure, losing the musty smell of long packing in a trunk. Silks, laces, the most delicate woolen goods show no signs of injury whatever from the treatment.

Of course, articles of leather, rubber and whalebone would be injured by the heat and are therefore disinfected with the mercuric solution and not permitted to go into the heated chamber.

Time required to charge chamber with apparel for disinfection, thirty minutes; time required for moist heat, twenty minutes; for removal of articles, fifteen minutes; a total of sixty-five minutes.

A large steamship, particularly a passenger vessel, may require two or three charges of the chamber. Amount of coal consumed: from two to four barrels per vessel.

In the summer of 1885 we devised and put up a chamber of the above general plan, but wholly inadequate as to size for the requirements of our service. This was replaced by one operating on the same principle, but fifty feet long and supplied with a twenty-horse power boiler, which latter proved too small for rapid work. This apparatus was burned last spring.

Our present chamber and supply boiler are of the dimensions given in the appended plates.

We prepared the plans of the foregoing described apparatus during the summer of 1884. Obtaining a liberal appropriation of \$30,000 from the State Legislature for the avowed purpose of establishing a new system of quarantine through the elaborations of purely experimental work; and thoroughly endorsed and sustained in all of our efforts by the progressive spirit of the press of New Orleans and by the merchants, we put the new system into practical operation and threw open the Mississippi to commerce June 10, 1885.

As it stands to-day, we sincerely believe in a nearly perfected state, it is the consummation of experimental effort, through a long and tedious process, beset with difficulties of the most perplexing and often disheartening kind.

Without precedent; having to deal with natural forces of prodigious power; repeatedly encountering unexpected difficulties; meeting with accidents; obliged continually to devise improvements upon our several inventions, and continually combatting a surly discontent and sometimes violent opposition from those subjected to the sanitary processes while these were still in an imperfect and unsatisfactory stage of development, the modernizing of quarantine and bringing it into line with other branches of science and art in the general progress, has been an expensive and difficult task.

We submit to your Honorable Committee the foregoing plans and specifications of the "System of Quarantine" established by the State of Louisiana in order to place the results of our experience in the hands of those who, like ourselves, are compelled to resist pestilential invasion by maritime quarantine.

We do this, encouraged by the hope that others may find in these results matter worthy of consideration and beneficial in strengthening their defences against a common enemy.

THE FOLLOWING ARE THE REQUIREMENTS IMPOSED UPON ALL VESSELS ARRIVING
AT THE QUARANTINE STATIONS IN THE STATE OF LOUISIANA,
DURING THE QUARANTINE PERIOD, BEGINNING ABOUT MAY 1ST AND ENDING OCTOBER 31ST.

All vessels arriving at the several quarantine stations in the State, together with their crews, passengers and their cargoes, shall be subjected to the inspection of the quarantine officers at the said stations.

All vessels, together with their cargoes, crews, passengers and baggage, arriving at the Mississippi Quarantine Station from intertropical American and West Indian ports, shall be subjected to thorough maritime sanitation, according to the following schedule :

First Class—Vessels arriving from non-infected ports.

Second Class—Vessels arriving from suspected ports.

Third Class—Vessels arriving from ports known to be infected.

Fourth Class—Vessels which, without regard to port of departure, are infected; that is to say, vessels which have yellow fever, cholera or other contagious or infectious diseases on board at time of arrival, or have had same on voyage.

Vessels of the first class to be subjected to necessary maritime sanitation at the Upper Quarantine Station, without detention of either vessels or persons, longer than may be necessary to place such vessels in perfect sanitary condition.

Vessels of the second and third classes to undergo the same conditions, together with detention for observation for a period of five (5) full days from hour of arrival in quarantine.

Vessels of the fourth class to be remanded to the Lower Quarantine Station, there to undergo sanitation and detention of vessels and persons such length of time as the Board of Health may order.

The five days' detention, as above provided, shall apply to all ports of the Gulf of Mexico and the

Caribbean Sea, exception being made in regard to vessels coming from ports south of the Equator, whose period of detention shall be three (3) days.

All vessels arriving from Mediterranean, or other ports known or suspected to be infected with cholera, or which may hereafter become infected, shall be subjected to maritime sanitation and such detention as the Board of Health may determine.

Vessels arriving from the above named ports and places, and belonging to the second, third, or fourth class, as set forth in the foregoing schedule, shall not be allowed to pass the Rigolets or Atchafalaya Quarantine Stations, or other State quarantine stations which may hereafter be established, without having undergone a period of detention of forty (40) days, and thorough cleansing and disinfection.

SPECIAL SUGGESTIONS TO OWNERS, AGENTS, MASTERS OF VESSELS AND PASSENGERS.

The Louisiana State Board of Health recommends the following suggestions to agents, owners, masters of vessels and passengers for the purpose of facilitating the work of quarantine officers and reducing the period of detention to a minimum:

1. That vessels should be stripped during the quarantine season of all woolen hangings, carpets, curtains and such like materials, and upholstered furniture, as far as practicable. Hair or moss mattresses to be replaced by wire or wicker beds.
2. That as far as possible vessels trading with tropical ports should be manned with acclimated crews.
3. Masters of vessels, ship and consular agents are earnestly requested to instruct passengers from quarantinable ports to dispense, as far as possible, with baggage which may be injured by wetting, in case

of pestilential outbreak on board, while undergoing disinfection. Such passengers are especially warned against bringing silks, laces, velvets and other fabrics of delicate texture, as they will be compelled to assume all risks of injury.

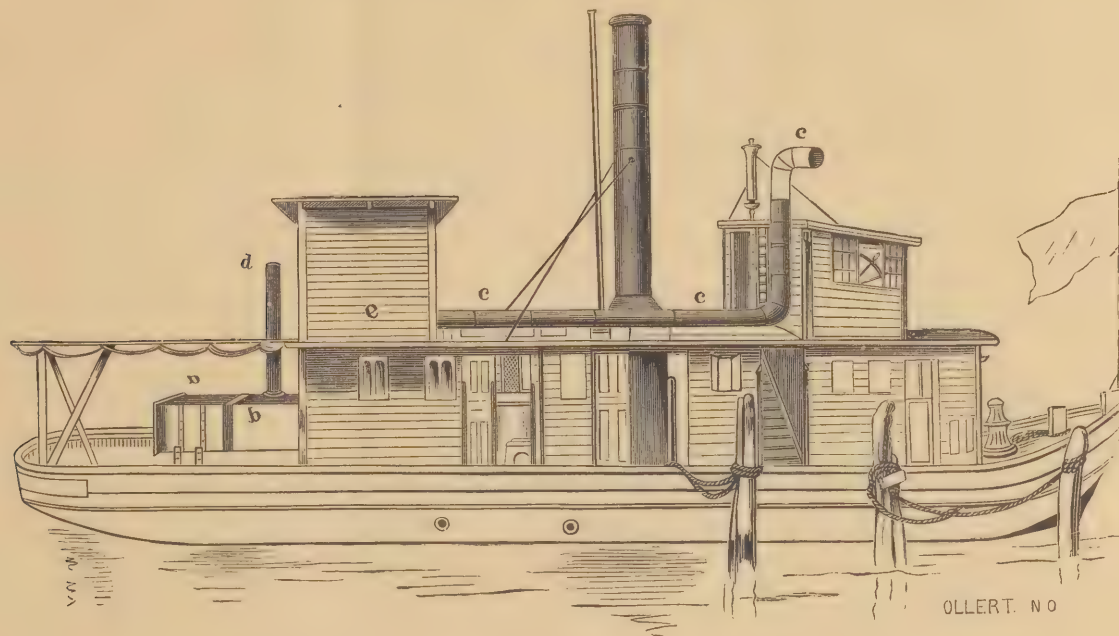
4. While in ports infected with yellow fever, vessels should be anchored out in the harbor when this is possible, and the crew prohibited from going ashore, especially at night.

5. When practicable, cargoes should be loaded in such a manner as to allow access to the pumps, and also to enable the quarantine officials to pump out and wash the bilge.

6. Special attention should be given to cleanliness of vessels and persons, and provision should be made for all possible ventilation of the entire vessel. The best disinfectants and instructions for using same can be obtained by application to the Board of Health or any of its officers.

7. Masters should, before arrival, see that the bilge is thoroughly pumped out and cleansed, and that the entire vessel be put in such good sanitary condition as to permit of the least possible detention. Fruit vessels particularly should be kept thoroughly cleansed for the purpose of avoiding delay at the Quarantine Station.

8. Vessels observing the above recommendations will receive special consideration at the Quarantine Station, detention and cost of cleaning, disinfecting, etc., being materially lessened thereby.



(PLATE 1.) TUGBOAT WITH FUMIGATING APPARATUS.

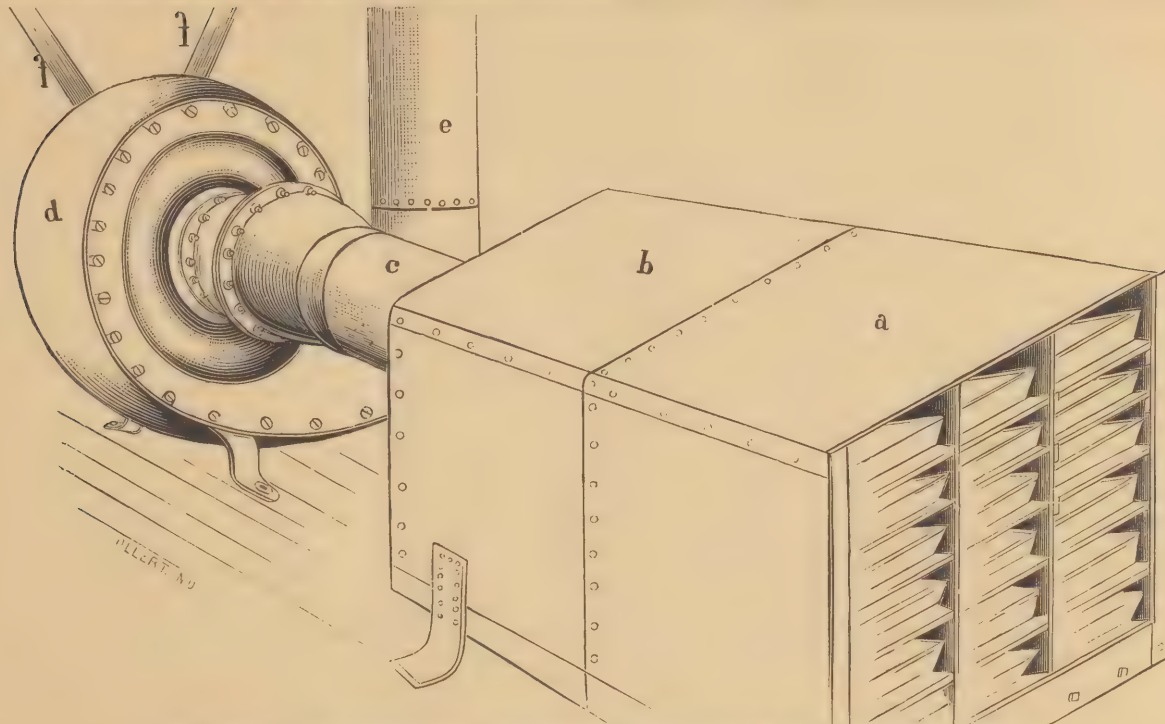
a. Furnace. *b.* Reservoir for reception of gas. *c.* Discharge pipe, conveying gas to ship's hold. *d.* Escape pipe for gas when fan is at rest and sulphur is burning; closed by a valve when fan is in motion. *e.* House protecting from weather the machinery for driving fan and containing accelerating gearing.

THE QUARANTINE SYSTEM OF LOUISIANA.



(PLATE 2.)

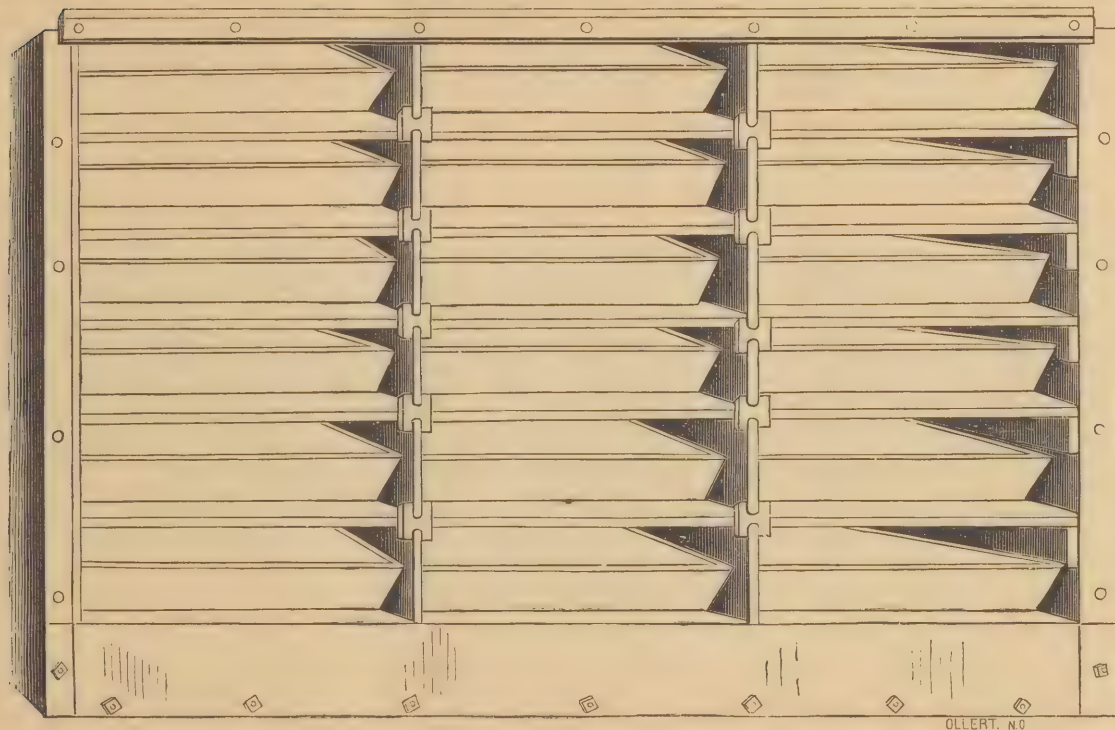
View of disinfecting wharf, showing tug fumigating vessel; elevated tank containing 8000 gallons of bi-chloride of mercury solution, 3 leads of hose from tank to ship. Gangway leading to building containing super-heating chamber.



(PLATE 3.) FUMIGATING FURNACE, RESERVOIR AND EXHAUST FAN.

a. Furnace of cast iron, $\frac{1}{2}$ inch thick; 3 feet wide, 3 feet long, 2 feet high. Upper and lower plates grooved for reception of partitions and sides shouldered for attachment, as shown in plate 4. *b.* Reservoir, No. 10 iron, same dimensions as furnace. *c.* Exhaust pipe connecting reservoir and fan. *d.* Exhaust fan, Starveant's No. 1, Medium Planing Mill Exhauster. *e.* Discharge pipe from fan made of No. 20 galvanized iron. *f.* Driving belt. Height of legs supporting furnace and reservoir, 10 inches. On reservoir at letter (*b.*) should be shown a 12 inch opening for escape pipe as indicated (*d.*) plate 1.

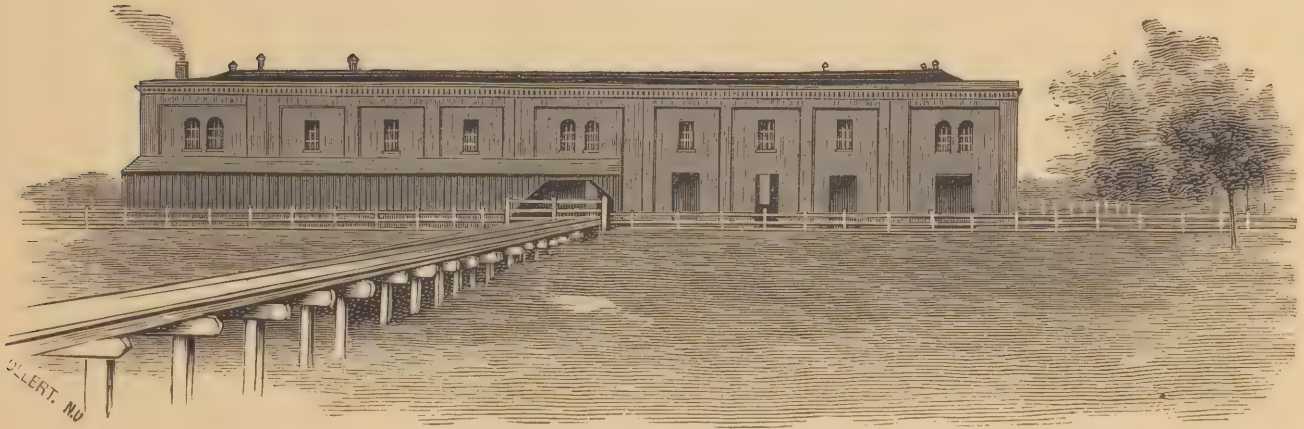
THE QUARANTINE SYSTEM OF LOUISIANA.



(PLATE 4.) FRONT VIEW OF FUMIGATING FURNACE.

Dimensions of each compartment 12 x 3¼ inches. Pans of cast iron 5-16 inch thick; 1½ inch deep, 11 inches wide and 2 feet 10 inches long, outside measure. Free space above pan about 1¼ inches.

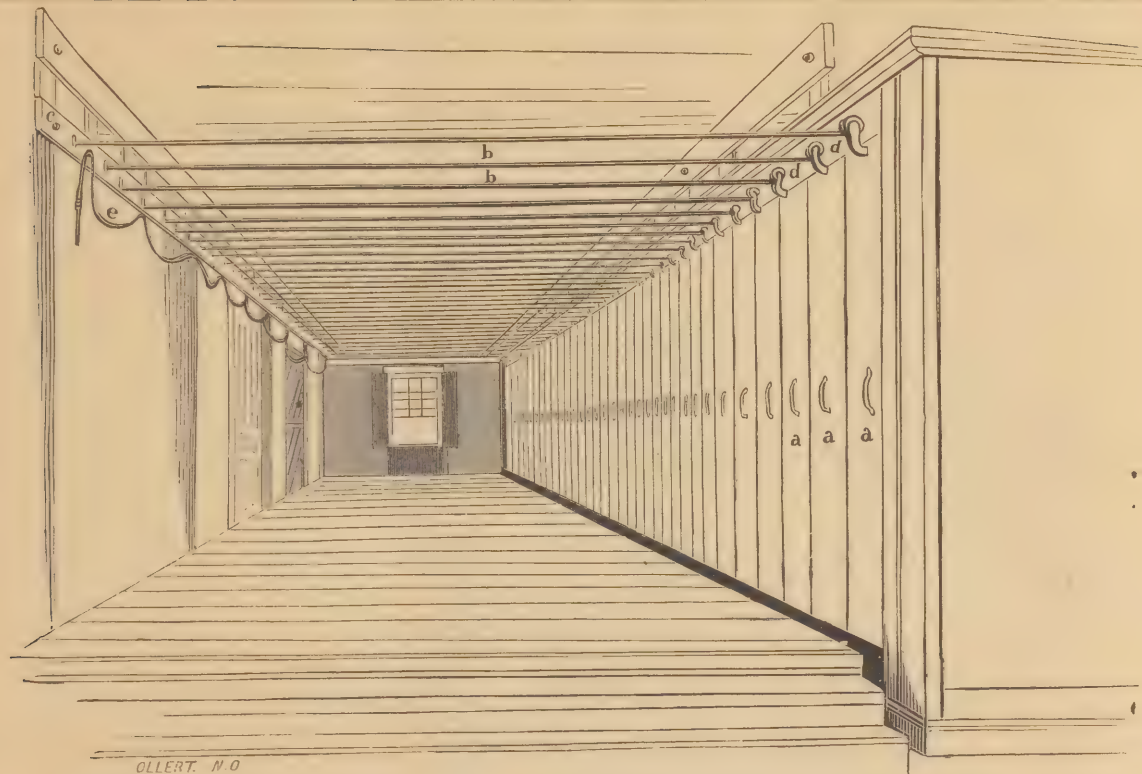
THE QUARANTINE SYSTEM OF LOUISIANA.



(PLATE 5.)

BRICK BUILDING in which is located the super-heating chamber; gangway in front connecting with disinfecting wharf.

THE QUARANTINE SYSTEM OF LOUISIANA.



(PLATE 6.) FRONT VIEW OF CLOSED SUPER-HEATING CHAMBER (60 feet long).

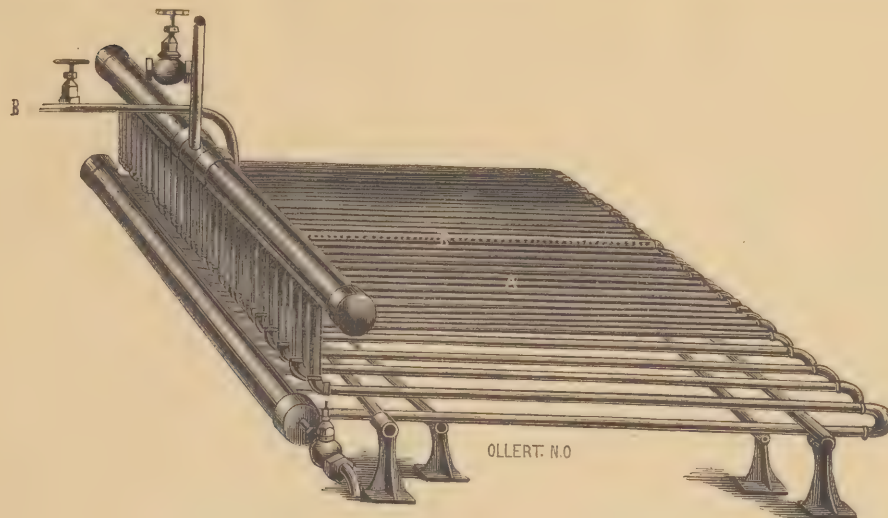
a. Panels; *b.* Rods upon which panels are suspended and travel. *c.* Outer support of rods. *d.* Rollers suspending panels on rods. *e.* Fire hose.

THE QUARANTINE SYSTEM OF LOUISIANA.



(PLATE 7.) SUPER-HEATING CHAMBER; TWO PANELS DRAWN OPEN.

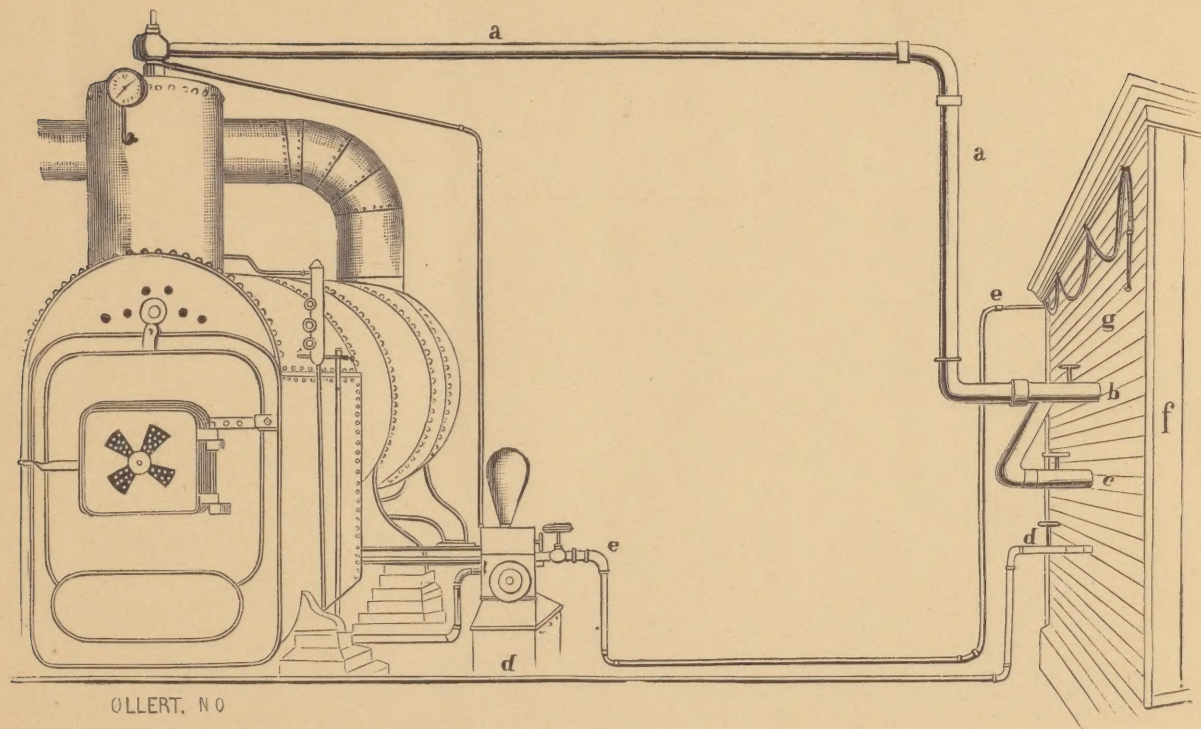
a. Panels. (Two lower rack bars not shown.) *b.* Rack bars. *c.* Rollers. *d.* Iron bars connecting front and rear panels. *e.* Rods upon which panel *a* are suspended and travel. *f.* Rear panel. Galvanized iron $\frac{1}{4}$ inch mesh screen in bottom of chamber.



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(PLATE 8.)

Super-heating steam coil for dry heat. *b-b*. Perforated steam pipe for moist-heat.



(PLATE 9.) BOILER AND STEAM CONNECTION WITH SUPER-HEATING CHAMBER.

a. Steam-main from boiler. *b.* Pipe supplying dry heat. *c.* Pipe supplying moist heat. *d.* Bleeder. *e.* Pipe from pump supplying fire hose. *f.* Front of chamber. *g.* End view of chamber.

